Amateur Radio On The International Space Station (ARISS) Overview

April, 2002

Frank H. Bauer, ka3hdo@amsat.org

Amateur Radio on Human Spaceflight Missions

Since 1983, organizations in the U.S. (SAREX), Germany (SAFEX) and Russia (MIREX), have worked with the space agencies to fly amateur radio and to support Educational Outreach on:

Space Shuttle

ISS

Mir

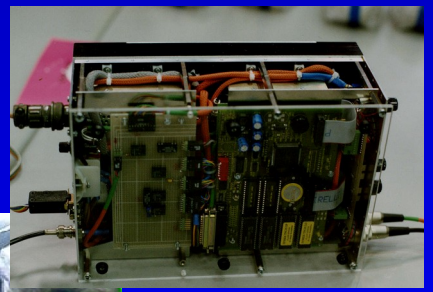
ARISS Objectives

Spark Student's Interest In Science & Technology

Crew Family Contacts (Crew Psychological Ops)

Promote Interest In Amateur Radio

Human Spaceflight



Experimentation

Development & Operations on the International Space Station (ISS)

Working with our international partners to develop & operate Amateur Radio on the International Space Station (ARISS)

ARISS Organization

- Nine international partners thus far—Belgium, Canada, France, Germany, Italy, Netherlands, Japan, Russia and United States
- MOU—Formed ARISS to represent the amateur radio community to the ISS Program
- Rules & Bylaws developed with delegates from Europe (4), America (4), Russia (2) and Japan (2)

Planned Capabilities for Initial Station ISS Ham Phase 1

2-way voice

Planned Capabilities for Initial Station ISS Ham Phase 1 (Continued)

Computer-to-Computer Radio Links

Amateur Radio E-mail from Mike Foale after Progress collision with Mir Spektr Module

Posted : 06/28/97 17:58
To : ALL
From : R0MIR
Subject: Mir Status

We have now got the base block, the module Kvant 2 back on line, leaving 2 more modules. Working very hard, lights in our mouths, in the dark, moving batteries about, to enable better charging, with solar arrays. O2 electrolysis soon, in old Kvant. Much interest from control center to do internal eva to reconnect power to lost Spkektr module, to receive its substantial electrical power from its large arrays.

Thanks for all your good wishes. Mike.

lanned Capabilities for Initial Statio
ISS Ham Phase 2

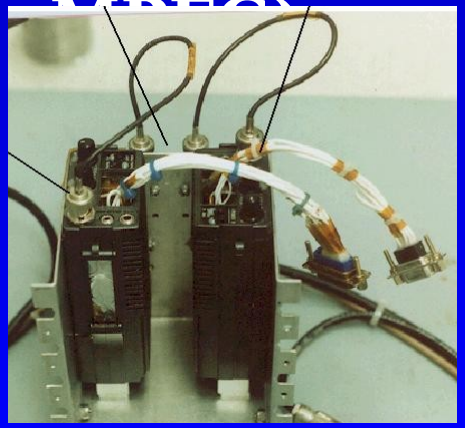
DigiTalker
(Voice Repeater)

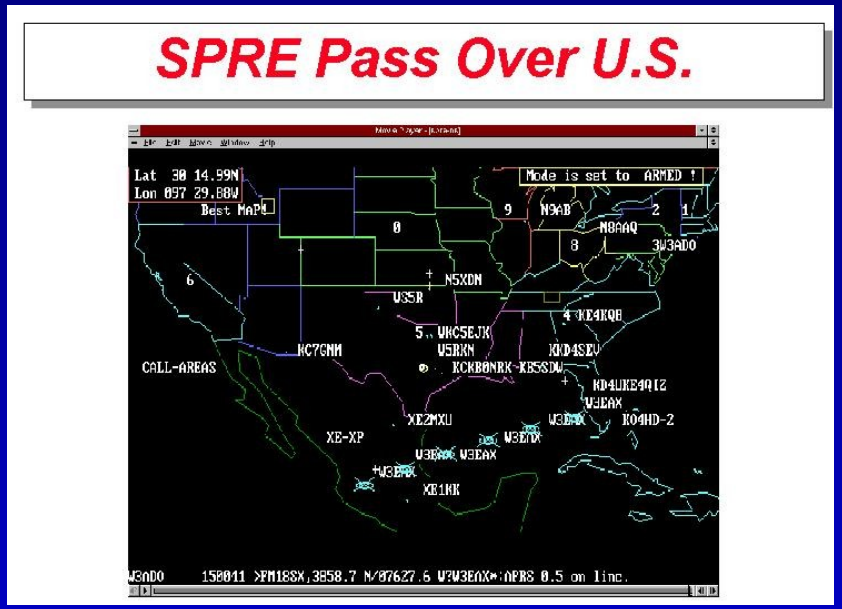
Slow Scan TV
(Photos/JPEG Images)

Future Capabilities

Amateur TV

(Standard, Spread spectrum, & MPEG)





R/T Internet TLM using amateur radio

Express Pallet--- External payloads w/

EQUIPMENT DEVELOPMENT PLANS

Development will be conducted in four ISS phases :

- **Initial Amateur Station (Part 1 on-orbit)**
- **Transportable Amateur Station (Developing)**
- **Permanent Amateur Station (Future)**
- **Express Pallet Experiments (Future)**

Initial Amateur Station Part 1

- **Improved Packet Module (Computer-to Computer Radio Link) (U.S. Built)**
- **Ericsson VHF Radio & UHF Radio for Voice ops (U.S. Built)**

Qualified & On-Board ISS!

- **Multi-band Antennas (Italian, U.S. & Russian Built)**

Qualified & On-Board ISS!

Initial Amateur Station Part 2

- **Digitalker/Speaker-Mic (German Built)**
- **SSTV (U.S. Built)**

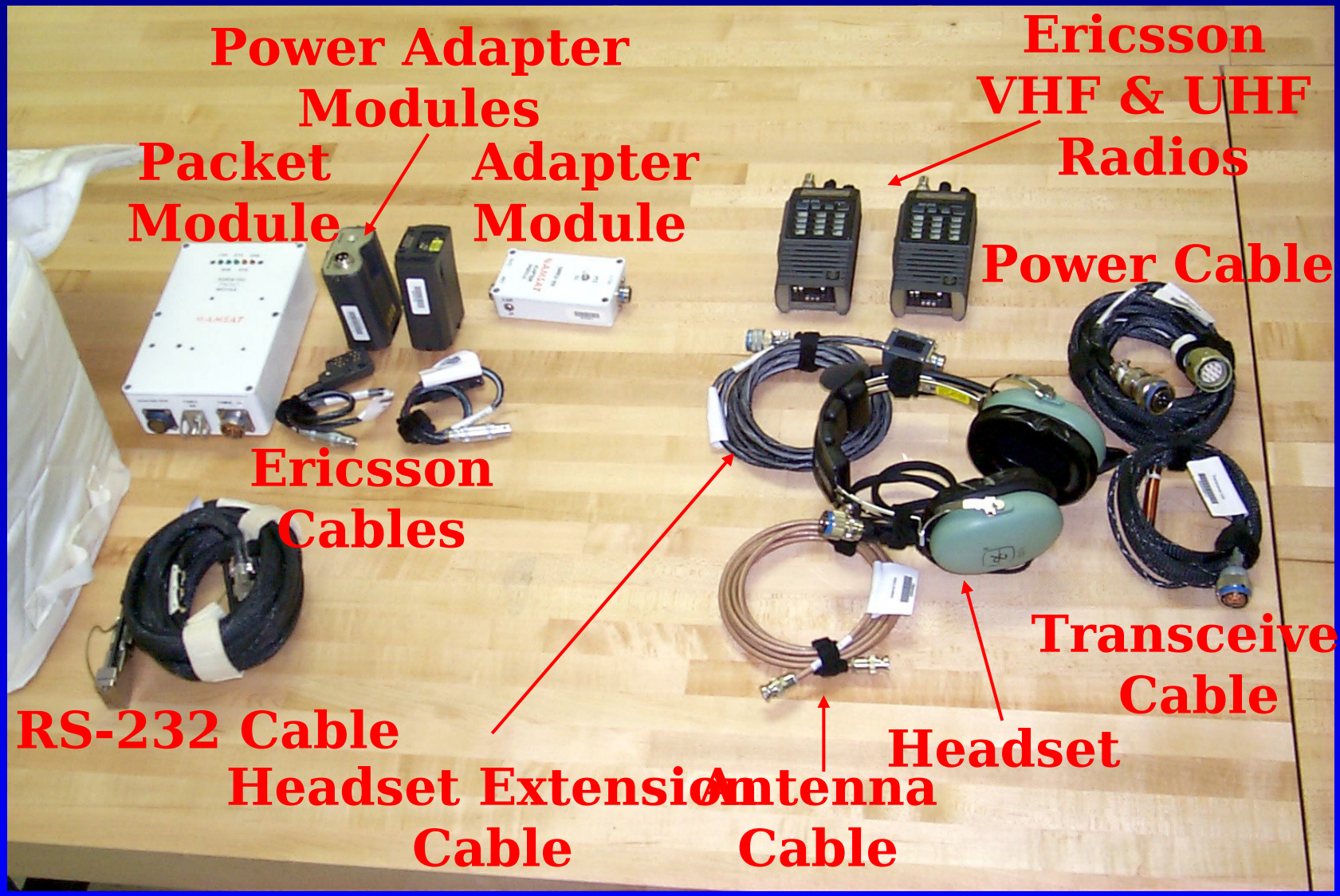
ARISS Equipment Installation History

- Service Module
  - Docking with ISS completed on July 25, 2000.
  - four module penetrations allocated for amateur radio use.
  - feedthroughs shared with EVA video system.
- STS-106 (2A.2B)
  - September 8, 2000
  - delivered internally installed hardware to ISS
  - initially installed in Zarya (FGB) & attached to Sirius antenna system for VHF (2 meter) operation
- Soyuz Flight 2R
  - October 31, 2000--Increment 1 crew launch
  - Increment 1 crew activates equipment and school group contacts begin on November 13, 2000

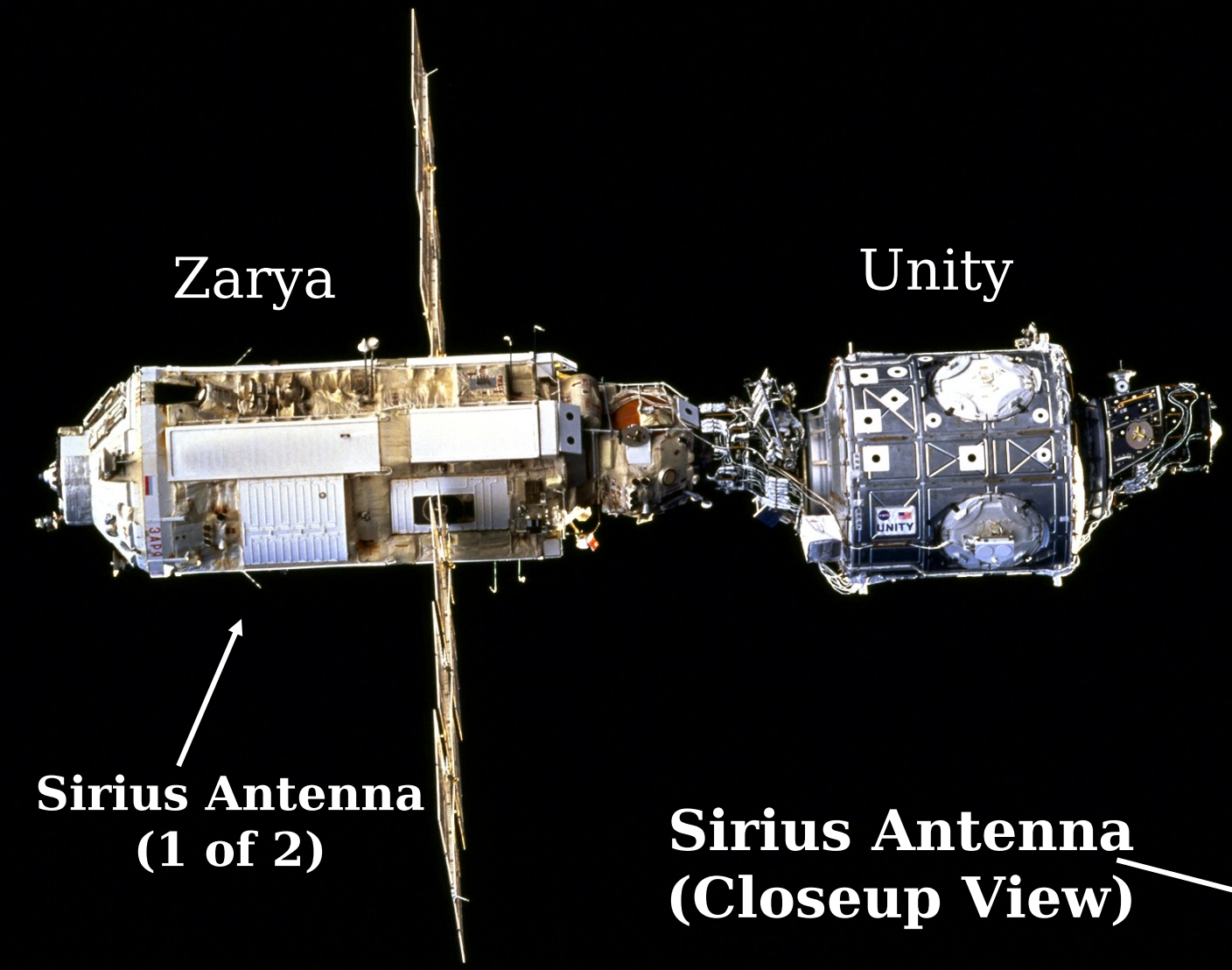
Initial Amateur Station Part 1

nitial Amateur Radio Station Undergoing EMI Tests at GSF

ARISS Provided Hardware to ISS HAM



SIRIUS ANTENNA LOCATION ON ZARYA



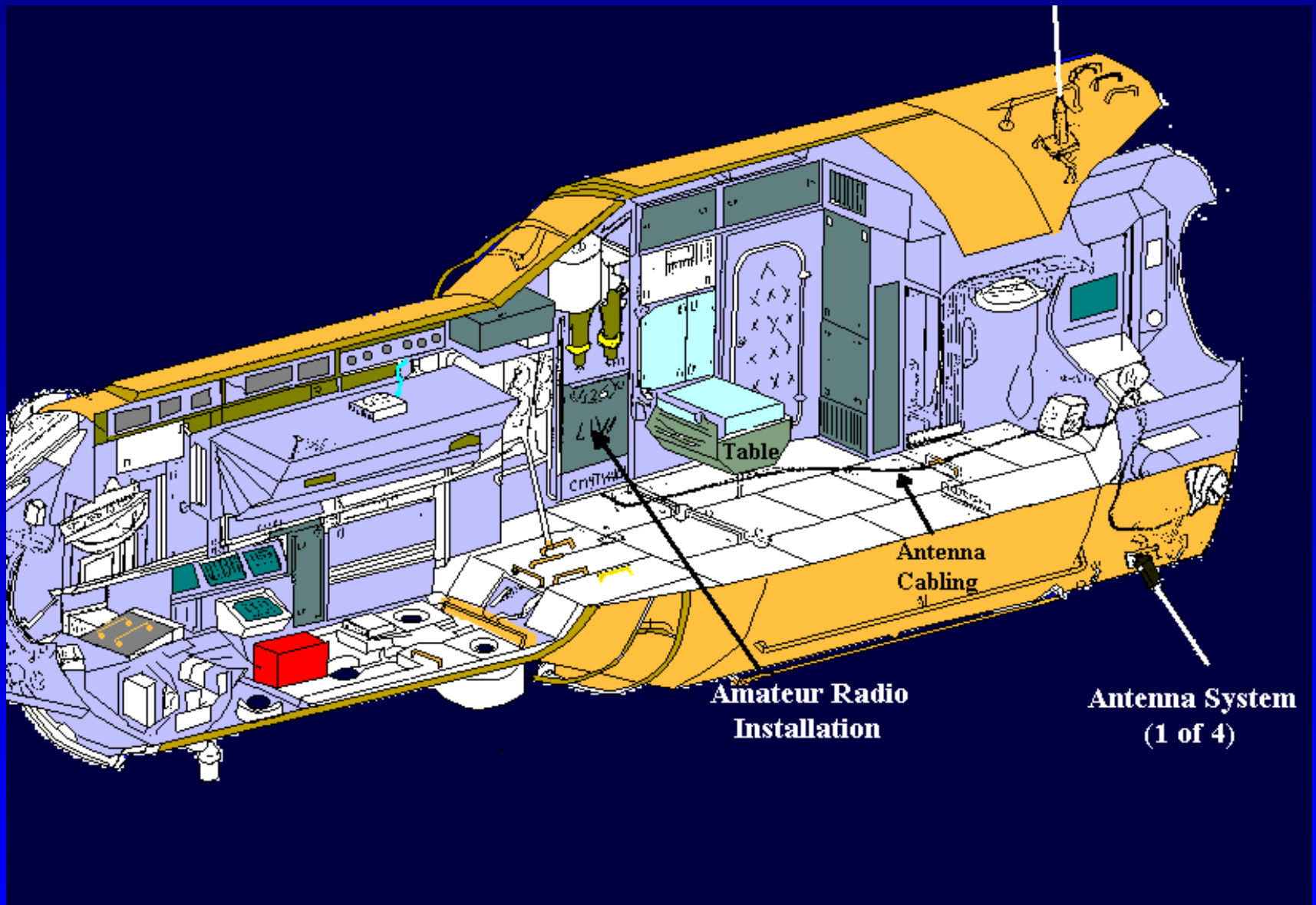
Sirius Antenna
(Closeup View)

Near Term Schedule—Phase 1

- STS-105 (7.a.1) August 2001
  - Delivered new packet module on orbit
  - Eliminates nocall/dead battery issue
  - Supports simultaneous 2 radio ops in FGB & Service Module

- STS-108 (UF-1) December 2001
  - Delivered 4 antenna systems to ISS
  - Delivered adapter module & add'l cables to support 2 radio ops to ISS
- Expedition 4 & 5 crews
  - Install antennas during Extra Vehicular Activities (EVAs)
  - Install 70 cm radio system in Service Module
- STS-TBD (Manfesting Request Pending—late-2002 to early 2003)
  - Deliver SSTV hardware to ISS

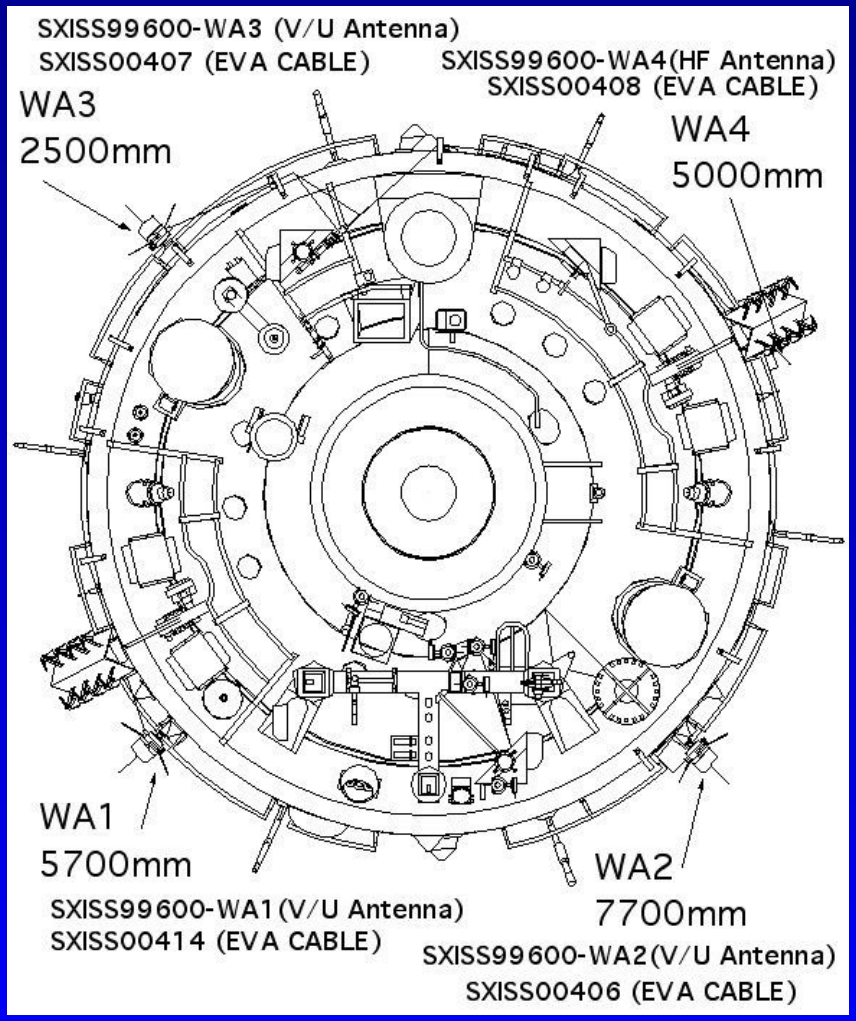
ARISS / ISS HAM
Location in and on the Service Module



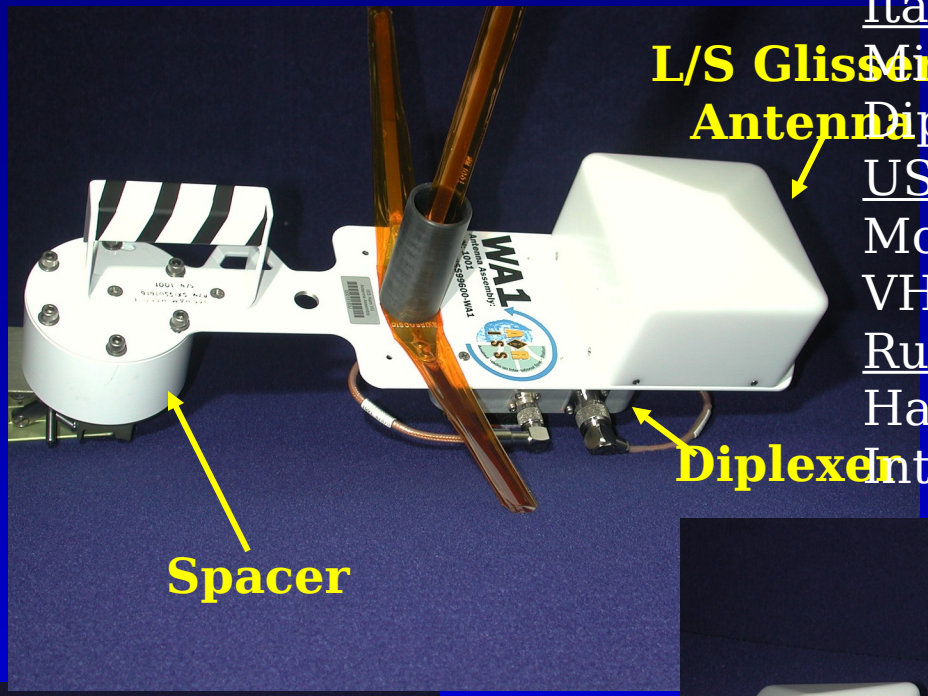
ARISS Hardware Location in Service Module

ARISS Team Members Sergej Samburov (Russia), Frank Bauer (US) & Alberto Zagni (Italy) (L to R) in front of ARISS Hardware Installation Ar

Antenna System Installation on Service Module



Antenna System w/ VHF/UHF Antenna Installed (1 of 4)

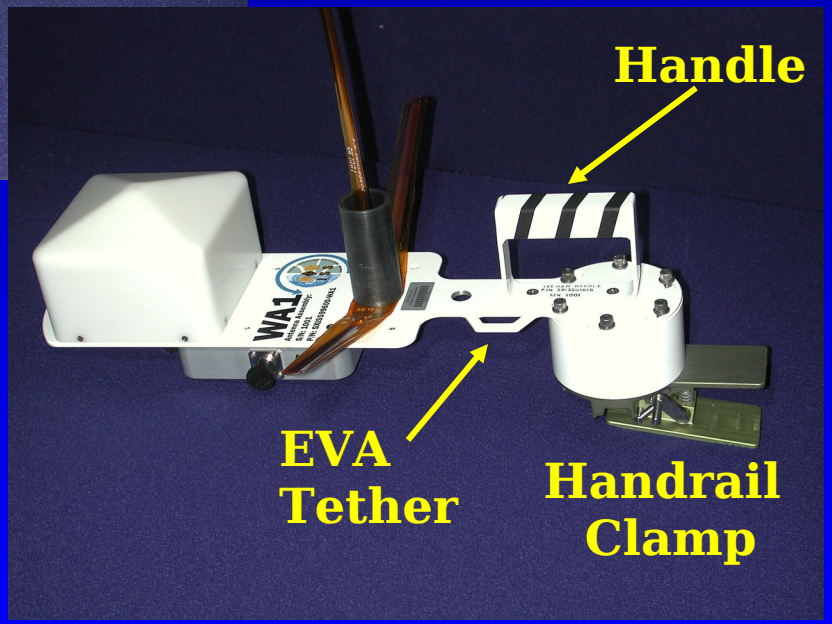


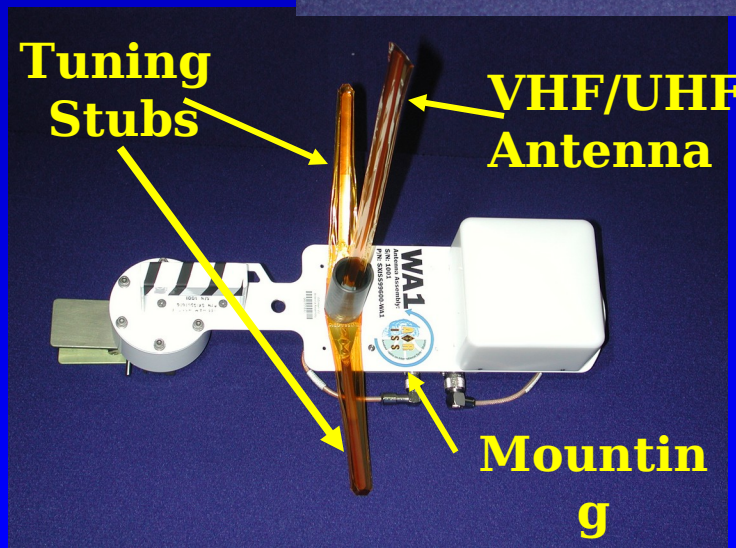
Internationally Developed

Italian Contribution:
- Microwave Antennas
- Diplexer

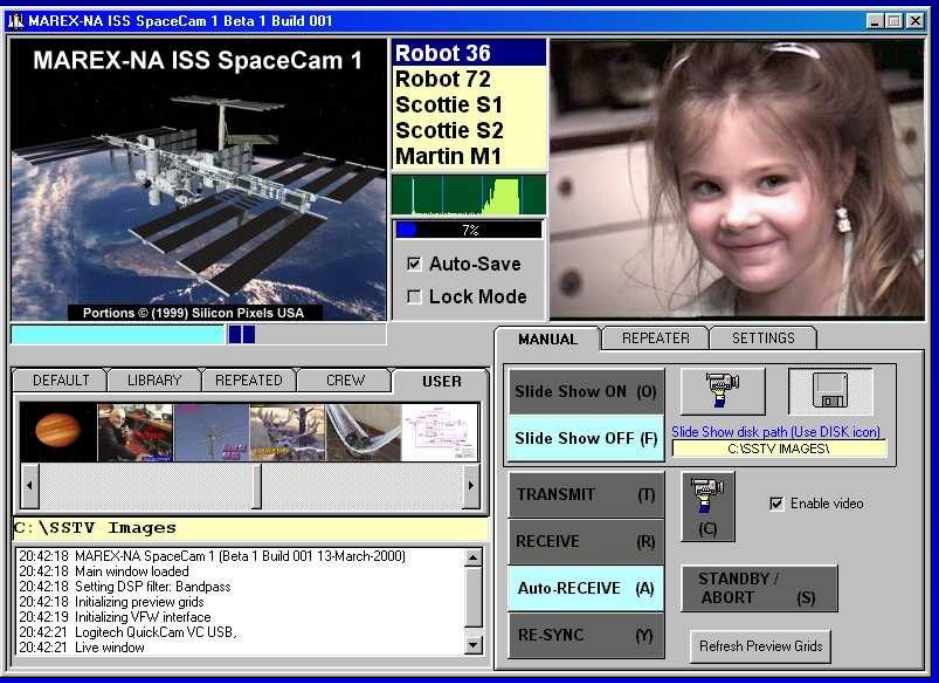
US Contribution:
- Mounting Plate
- VHF/UHF Antenna

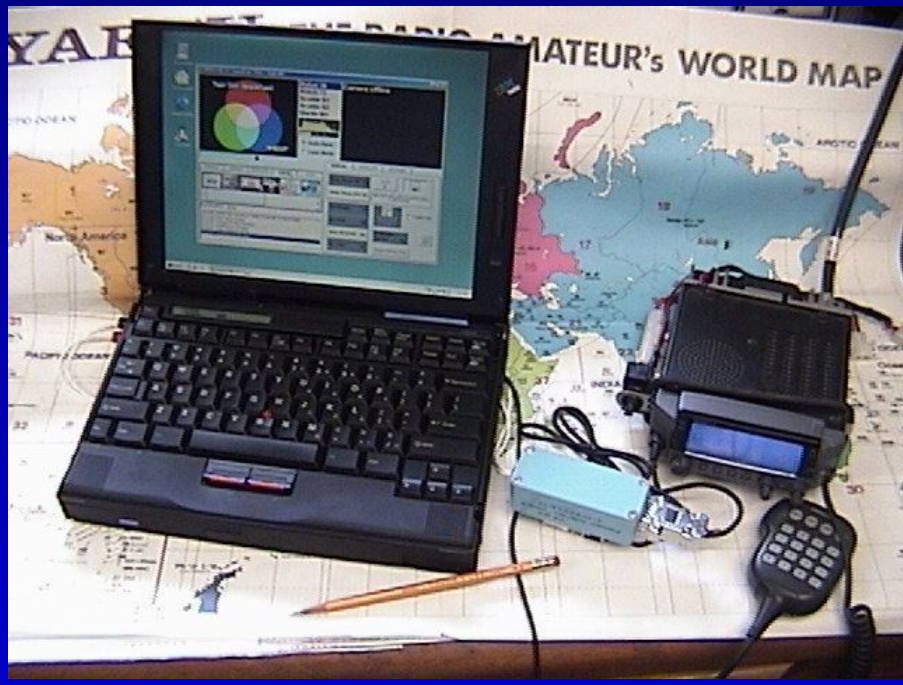
Russian Contribution:
- Handrail Clamp
- Interconnecting Cables





Next Up: SSTV



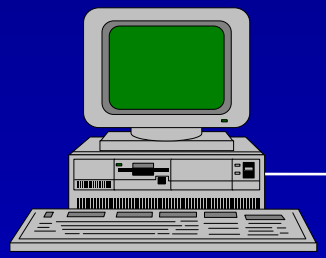


SpaceCam 1 H/W & S/W

Operations

- Downlink:
  - Worldwide both voice & packet: 145.80
- Uplink:
  - Packet: 145.99
  - Region 1 voice: 145.20
  - Region 2 & 3 voice: 144.49
- Callsigns:
  - DL0ISS
  - RS0ISS
  - NA1SS
- Crew Schedule
  - ~0700 to 1900 UTC
  - Off Saturday Noon to Sunday evening

DIRECT CONTACT INSTALLATION



PC WITH ORBIT PREDICTION PROGRAM AND TRACKING INTERFACE

ROTOR CONTROL UNIT

CIR. POL. YAGI

AZ/EL ROTOR

AC POWER

12 V POWER SUPPLY

2 METER TRANSCEIVER

2 METER AMPLIFIER 80-170 W

ANTENNA PREAMP

PRIME STATION

UP S

12 V POWER SUPPLY

2 METER TRANSCEIVER

2 METER AMPLIFIER 80-170 W

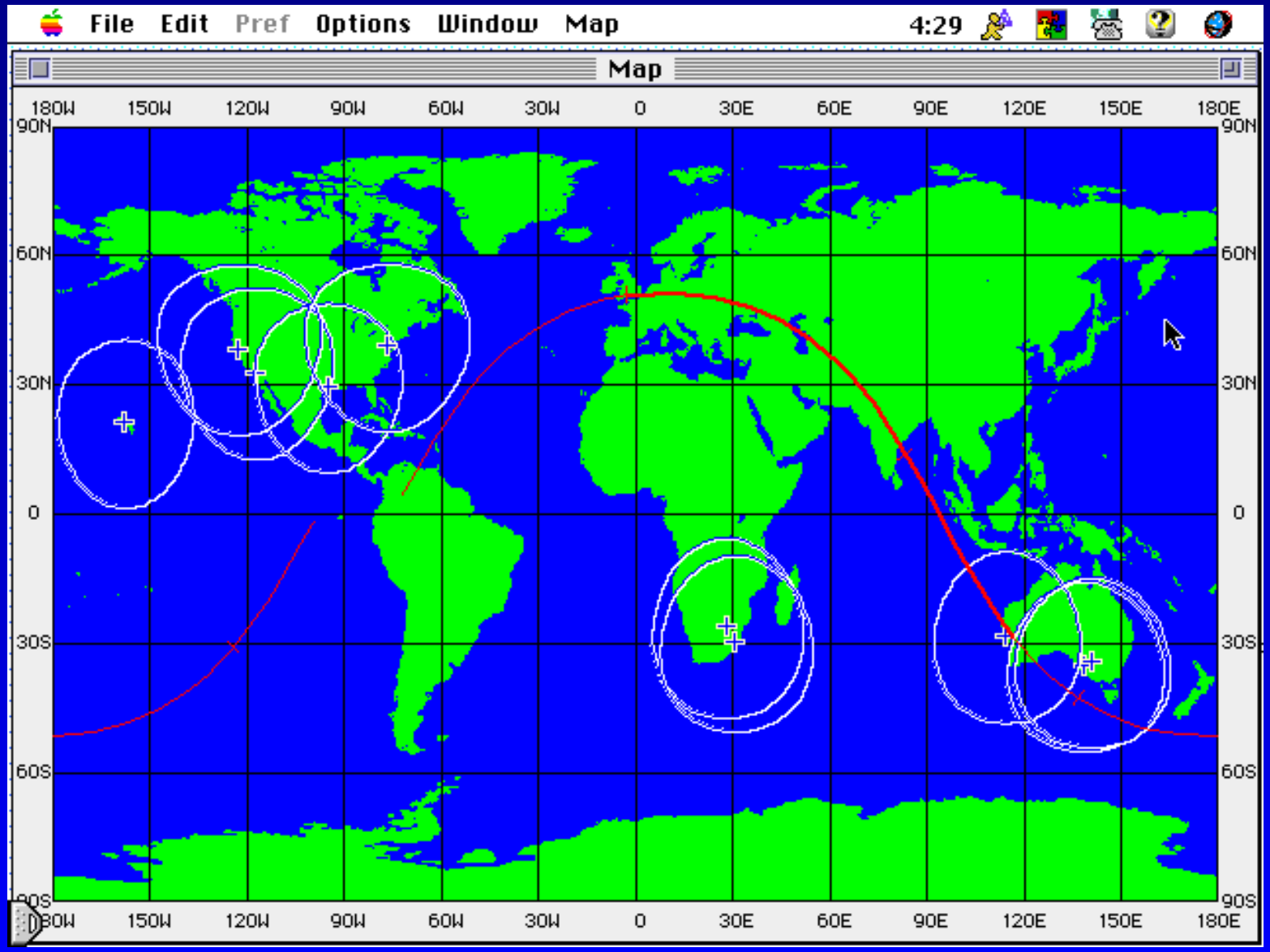
COAX

2 METER VERTICAL

ROOF TOP

BACKUP STATION

Telebridge Network



Susan Helms on the Air during Field Day

Field Day Results:

- 250 stations contacted
- 202 after dupes remove
- Bonus Points:
  - Solar Power
  - Off Commercial mair
  - PR
- Total points: 1010

KD5OPQ in the ISS ham shack

BUS

QSL Card

RSØISS
NA1SS
A R
ISS
Amateur Radio on International Space Station

ARISS Information

http://
ariss.gsfc.nasa.gov